POLICY RESEARCH WORKING PAPER 1520

Regulating Telecommunications in Developing Countries

Outcomes, Incentives, and Commitment

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The private sector invests heavily in infrastructure, makes reasonable returns, and improves productivity when regulators reduce the firm's information advantage, induce the firm (through pricing) to operate efficiently, and institute safeguarding mechanisms to protect the firm against expropriation of assets or quasi-rents.

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Summary findings

In response to the recent wave of privatizing and regulating monopolies in developing countries, Galal and Nauriyal evaluate the impact of different regulatory schemes on private sector behavior in the telecommunications sector in seven countries.

They find that regulation is most effective — meaning, it results in substantial investment by the private sector, reasonable returns on this investment, and greater productivity — where the government/regulators reduce the firm's information advantage, induce the firm (through pricing) to operate efficiently, and institute safeguarding mechanisms to protect the firm against expropriation of assets or quasi-rents.

Conversely, where the government/regulators fail to resolve information, incentive, and commitment problems, private sector returns are relatively high, and investment and productivity are relatively low.

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Regulation of Telecom in Developing Countries:
Outcomes, Incentives and Commitment

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I. INTRODUCTION

Developing countries have traditionally relied on public ownership and bureaucratic control for the provision of telecommunications services, power, water, railroads, roads, port services, and gas. This preference is now being reversed. An increasing number of developing countries in Latin America, Asia, and Africa are relying on private ownership and regulation for the provision of such goods and services. Given that other countries are likely to follow suit, it is important at this juncture to explore whether this shift in orientation is associated with positive outcomes for the producers and consumers, and to identify the regulatory features which contribute to success or failure.

The consequences of this shift in orientation has been addressed from different perspectives. For example, Galal et al. (1994) evaluated the welfare effects of divesting a dozen enterprises, mostly in utilities, in four countries and found beneficial effects for most of the actors involved. Levy and Spiller (1993) analyzed the role of government commitment in persuading the private sector to invest in five country case studies, and found a positive association between both. Wellenius and Stern (1994) documented the recent reforms in the telecommunications sector in developing countries, and described best practice solutions. This paper builds on these studies. Its main contribution lies in its attempt to empirically explore the relationship between the outcomes of regulatory reforms, regulatory incentives and government commitment.

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Analytically, we view regulation as a contractual relationship between the regulated firm and the regulator. The government sets the rules of the game but the firm has private information about its cost which the regulator cannot observe perfectly.[2] Because the firm has private information, its performance depends on whether efforts are made to reduce this information advantage or not. Second, because some degree of information asymmetry will inevitably remain, the firm's performance depends on whether it is provided appropriate prices to invest and operate efficiently or not. Finally, because contracts are imperfect and must be negotiated ex post,[3] the firm's performance also depends on the credibility of government commitment with respect to upholding the terms of the contract. Failure on the part of the government/regulators to reduce the firm's information advantage, provide appropriate incentives (mainly through pricing) to induce the firm to operate efficiently, and institute safeguarding mechanisms to protect the firm against expropriation of assets will predictably be associated with excessive rates of return to the producer, low levels of private investment, chronic unmet demand and low productivity. Consumers will also lose.

To explore this proposition, we analyze the recent regulatory experiences of seven developing countries. The seven countries are Argentina, Chile, Jamaica, Malaysia, Mexico, The Philippines, and Venezuela. Although we identify the recent trends in private sector participation in monopoly sectors in general, we limit our analysis to the telecommunications sector because it is the sector where governments in developing countries have opted to privatize the most.

Our findings are consistent with the above proposition. On the one hand, Chile was the most successful in resolving the information and incentive problems through competition and benchmark pricing. It was also the most successful in resolving the commitment problem by embodying the regulation in a law, which is difficult to change because the country's legislature is divided among multiple parties and the executive branch is unable to change laws at will. As a result, the producers and consumers were better off

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[2] As elaborated, for example, in Besanko and Sappington (1987), Caillaud, Guesnerie, Rey, and Tirole (1988), and Grossman and Hart (1983).

[3] As discussed, for example, by Hart and Moore (1988), Hart and Holmstrom (1987), and Williamson (1989).

following privatization and regulation. On the other hand, the Philippines was the least successful in resolving the information, incentives or commitment problems. Consequently, and despite over four decades of private sector involvement, the telecom sector continues to suffer from serious under investment and low productivity. In the remaining countries, the picture is mixed, as are the results.

These findings have important policy implications, which are offered at the end of the paper. Below, we first elaborate the analytical framework. In section III, we assess the regulatory regimes in our sample countries with a view to evaluating the extent to which they deviated from recommended solutions. In section IV, we contrast our assessment of the regulatory regimes with sector performance. We conclude in section V.

II. ANALYTICAL FRAMEWORK

Following the incentive literature, we view regulation as a contractual arrangement between the regulated firm and regulators.[4] The government sets the regulatory rules but the firm has private information about its cost which cannot be observed perfectly by the regulators.[5] Information asymmetry and imperfect observability create a divergence of interest between the consumers and producers, thereby giving rise to strategic behavior on the part of the regulator and regulated firms. In this setting, the regulator's first task is to make the information problem go away, perhaps by motivating the firm to reveal its information voluntarily. Where information asymmetry persists, the regulator's second task is to devise an incentive scheme that simultaneously restricts the firm's capacity to extract information rent and persuades it to operate efficiently.

Another problem arises because contracts in utilities span a long period of time during which unforseen events can occur. Contingencies to cover these events are difficult to identify beforehand and costly to fully describe in the current contract, creating uncertainty for the private sector about how contracts will be renegotiated. To reduce this

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[4] This view of regulation differs from the traditional view, which focuses on devising alternative (non-linear) pricing schemes to minimize distortions resulting from non-convexities in the production function.

[5] Caillaud, Guesnerie, Rey, and Tirole (1988), and Besanko and Sapppington (1987), survey the theory of regulation under incomplete information.

uncertainty and its attendant strategic behavior on the part of the firm, the third task for the government/regulators is to explicitly specify how conflicts will be resolved in the future, who will enforce their resolutions, and how the regulatory rules will be insulated form arbitrary political interventions.

In sum, regulation is likely to be most effective if it is designed to: (1) motivate the firm to reveal its private information, (2) induce the firm to operate efficiently, and (3) convince the firm that the government will not expropriate its assets or quasi-rents in the future. Drawing on a vast literature, we elaborate how these conditions can be met below.

II.1. Information

Motivating the firm to reveal its information can be achieved to some degree in a variety of ways. These include outright competition, competition by comparison, auctions and a sort of market contestability (discussed below). *Competition* provides the least costly solution to the information asymmetry problem. In telecommunications, the room for potential competition has increased significantly in recent years due to technological progress. For example, it is now possible to engage a number of suppliers in providing such services as long-distance phone calls, cellular phone calls and a variety of value-added services (e.g., data transmission, facsimile). A similar possibility presents itself in electricity generation, where competition is also feasible among generating companies.

Where technology does not permit competition (because of economies of scale, for example, in the provision of basic telephone services), *competition by comparison* can be a useful way to reduce the firm's information advantage. The participation of multiple suppliers in the same country (even if each supplier is a regional monopoly) makes it possible for the regulator to compare performance across firms. Barring collusion between them, this possibility provides the regulator with a mechanism to verify the information provided by each firm and to gather information about the influence of a common environmental parameter (e.g., weather) on the relative performance of firms.

Third, requiring bidding for the right to provide a service is another information extracting mechanism. *Auction* can aid the regulators to identify the most efficient potential supplier, and simultaneously limit information rent. Thus, even if the potential producers

have private knowledge of their likely production costs and the regulator wishes to select a single firm to serve as the sole producer of a commodity (e.g., basic telephony), the government can link the compensation rules under the franchise to the winning bid. One way of doing so is to indicate that a low winning bid will be interpreted as a prediction that production costs are likely to be high. To protect the winning bidder against the prospect of high cost realizations, the government can announce that it will share the additional costs. Laffont and Tirole (1986), McAfee and McMillan (1987), and Riordan and Sappington (1987) argue that this linkage will promote more aggressive bidding.

Finally, much like bidding before the contract is granted, the threat of competition after the contract is granted can also serve to limit the producer's capacity to extract information rent. A firm such as a basic telephone provider that faces no potential competition once it is selected may have a strong incentive to inflate production costs or to reduce the quality of its services. Given that exit and entry are costly, these perverse incentives may be mitigated somewhat if the regulation embodies provisions that ensure that an alternative producer can be called upon to replace the incumbent if the latter fails to meet certain performance conditions (Demski et al., 1987; Nalebuff and Stiglitz, 1983).

II.2 Price regulation and Incentives

Where monopoly situations are unavoidable, price regulation is necessary to allow the firm to make a fair rate of return and to protect the consumers. Prices can be regulated using rate of return regulation, price cap regulation or benchmark regulation. Each of these pricing schemes has its own incentive properties.[6] Under *rate of return regulation*, prices are set so that the firm can recover its costs and make a fair rate of return. Where the regulators are unable to identify the rate base appropriately (allowable fixed costs), this scheme induces firms to inflate costs, invest excessively, and engage in cross subsidization by shifting costs from unregulated to regulated services.

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[6] These properties have been discussed at length elsewhere. See for instance, Brown et al. (1991), Einhorn (1991), and Schmalensee (1989).

Under *price cap regulation* (also referred to as RPI-X regulation), a ceiling is imposed on the average tariff increase for a pre-specified basket of services in which the firm has a monopoly. The average price increases will not exceed the Retail Price Index minus a number X that is predetermined for a given period of time. To the extent that the X factor is positive, this scheme will transfer to consumers the benefits from technological progress and improved productivity. Because it is set independent of the firm's costs, the scheme limits the firm's opportunity to distort its cost data, or shift the costs of competitive services onto their captive monopoly activities. Instead, the firm is motivated to minimize costs because it can retain any profits that may result from cost cutting in the period between tariff revisions. The main shortcoming of this scheme is that it leaves the determination of the X factor to the regulators, which creates uncertainty. Moreover, to the extent that the regulators keep an eye on the firm's rate of return, the scheme may degenerate to a rate of return regulation.

Finally, under *benchmark regulation*, tariffs are set such that the firm makes a fair rate of return, but with reference to some yardstick other than its actual costs. The yardstick can be the cost of an "efficient" firm, or the cost of a similar firm. Because costs are divorced form actual costs and because tariffs are revised only periodically (say, every few years), benchmark regulation has similar cost saving properties as those associated with price cap regulation. Moreover, because the scheme explicitly specifies a fair rate of return, it has the property of limiting the discretion of the regulators in setting the X factor as in price cap regulation. The main shortcoming of this scheme is that disagreements can arise with respect to the definition of the benchmark.

II.3 Commitment

Commitment on the part of the government not to behave opportunistically can be strengthened by specifying clear conflict resolution mechanisms, entrusting the enforcement of regulation to qualified parties, and insulating the regulatory rules from arbitrary reversals by politicians.

Conflict resolution mechanisms involve specifying the course of action each party can take when they disagree. They are particularly important with respect to prices, the

terms of interconnection and the rules of entry.[7] Resolving conflicts may entail arbitration, for example, where disagreements arise over the X factor (assuming the RPI-X formula is adopted), the calculation of the fair rate of return (if that is followed), or the definition of the efficient firm (if benchmark regulation is applied). Or it may entail court hearings if the regulator, consumers or potential competitors believe that the incumbent behaves in a way that deters entry.

Establishing conflict resolution mechanisms is only valuable, however, with the knowledge that these mechanisms will be enforced at a reasonable cost. The *enforcement* of contracts requires identifying a neutral third party, who must have the means to force each party to respect the agreement, acquire the information that both parties posses, and observe what both parties can observe. In a given country, the choice of a particular agency or agencies depends on which institution has (or could have) these qualifications. In general, the menu of options includes the court system, a regulatory commission, the executive branch, or arbitration.

Finally, even if conflict resolution mechanisms and enforcement are sorted out, the credibility of regulation may be eroded for *political reasons*, especially where the current administration is not able to bind future ones. Given that successive administrations are likely to have different constituencies, they may change the regulatory rules for redistributive purposes rather than efficiency considerations.[8] To minimize the influence of politics on regulation, it may be desirable, for example, to stagger the appointment of the regulators counter cyclical to the political round, establish the regulatory agencies as quasi judicial entities, or embody the regulation in a law, especially where laws are difficult to change. If all fails, it may be necessary to resort to external guarantees to establish credibility and attract private investment.

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[7] The need for conflict resolution mechanisms can be reduced by preventing conflicts from arising in the first place. This can be achieved in part by clearly specifying the regulatory rules themselves. For example, where prices are set on the basis of the RPI-X formula, the uncertainty surrounding the X factor can be mitigated by specifying it over a given period of time.

[8] Baron (1988a), for example, shows using a model of imperfect information and majority rule that the legislators with distributive preferences may prefer a regulatory policy that achieves a desired distribution at the expense of efficiency. See also Baron (1988b) and Baron and Besanko (1987).

III. ASSESSMENT OF REGULATION: COMPARATIVE CASE STUDIES

How closely did each of our sample countries emulate the solutions recommended in the previous section to reduce the firm's information advantage, provide efficiency enhancing pricing schemes, and offer credible commitment? Before attempting to answer this question, we first place our sample in the context of the wider phenomenon of increased private sector participation in monopoly sectors in developing countries.

III.1 Recent trends and sample countries

Many developing countries are increasingly replacing public by private monopolies. Table 1 displays the magnitude and sectoral distribution of the proceeds from divesting utilities in these countries over the period 1988-92. The magnitude of privatization has been increasing steadily, totalling nearly $20 billion in sale revenue in just five years. This trend can be interpreted as a pragmatic response to the inability of governments to meet pending demand because of fiscal constraints. It can also be interpreted as a reaction to the increasing recognition of the perceived (and increasingly documented) efficiency differential of private over public management of assets. Finally, it can be interpreted as a graduation of countries to a higher level of economic development, in which the private sector is now able to mobilize large savings to undertake lumpy projects.

Table 1. Value of recent infrastructure privatization in developing countries

	Millions of U.S. Dollars						Percent
Subsector	1988	1989	1990	1991	1992	Total	of Total
Telecommunications	325	212	4036	5743	1504	11821	59.70
Power	106	2100	20	346	2726	5299	26.70
Gas Distribution	0	0	0	0	1906	1906	9.60
Railroads	0	0	0	110	217	327	1.60
Roads	0	0	250	0	0	250	1.20
Ports	0	0	0	0	7	7	0.03
Water	0	0	0	0	175	175	0.80
Total	431	2312	4307	6200	6535	19785	100
Telecom & power (% of total)	**100**	**100**	**94.1**	**98.2**	**64.7**	**86.5**	

Source: Sader (1993) as cited in World Development Report, 1994.

Whatever the interpretation, the bulk of privatization occurred in the telecommunications (60 percent) and power (27 percent) sectors (table 1). In contrast, privatization was limited in the railroads, roads, ports and water sectors. We speculate that this phenomenon is due in part to labor intensity, for example, in railroads and ports, where labor opposition may have prevented privatization from taking hold. We also speculate that the limited privatization in water is due in part to the fact that the provision of water typically involves a high subsidy, which governments find difficult to give to the private sector on political grounds.

Within the telecommunications sector, we identified 29 developing countries which shifted from public to private ownership of basic and/or value added telecom services between 1989 and 1993. More countries may have followed suit since. From this universe, we selected all the seven countries with private sector participation in basic telecom services. Although the sample is small and not random, table 2 illustrates that these seven countries are diverse in their level of economic development as measured by their real per capita GNP, rate of economic growth, initial (1981) level of development of the telecom sector, the timing of the regulatory reform and the extent of divestiture.

Table 2. Sample countries with private sector participation in telecom

Country	Year of Regulatory Reform[a]	Share of Private Sector (%, 1993)	GNP Per Capita ($, 1981)	GDP growth rate (1981-92)	Years of Waiting Time For Phone[b]	Teledensity (lines per 100 people, 1981)
Argentina	1990	100	3442	1.4	4.1	7.7
Chile	1987	100	1995	4.5	5.7	3.4
Jamaica	1988	100	1242	1.9	9.0	2.6
Malaysia	1987	25	2096	6.3	1.6	3.6
Mexico	1990	100	2510	1.4	4.9	4.4
Philippines	1986	100	669	1.2	14.7	0.9
Venezuela	1991	40	3647	2.5	2.5	5.6

a. Prior reforms were undertaken in Chile (1978, 1982) and Jamaica (1982); additional reforms were undertaken in Malaysia in 1990. With the exception of Philippines, where the telecom sector has been privately owned for decades, and Malaysia, this is also the year of privatization.

b. As of 1987 for Argentina and 1986 for Jamaica. Calculated as a ratio of the number of applicants on waiting list to the average number of main lines added over the last three years.

Sources: World Development Report 1994, International Telecommunications Union, and Author's search.

III.2 How did the sample countries attempt to resolve the information asymmetry problem?

Table 3 shows how each country sought to organize the market structure of its telecom sector, award the franchise and achieve some market contestability. In the market for basic services, all countries ended up essentially with a monopoly, except Argentina. Although Chile and the Philippines permitted entry into that market, CTC (in Chile) and PLDT (in the Philippines) maintain a market share of about 95 percent. Argentina did better by splitting the market for basic services into two regional monopolies (one in the north and another in the south), which has the potential of aiding the regulators in verifying the information provided by each firm.[9] In the market for value added services, all countries, with the exception of Jamaica, ensured a competitive setting. Jamaica deviated from recommended solutions by providing Cable & Wireless an exclusive concession to provide both basic as well as value added services for a period of 25 years.

Table 3. Information revealing mechanisms

Country	Market Structure		Bidding/Auctions	Contestability
	Basic services	Value added services	(Basic services)	(Basic services)
Argentina	Duopoly[a]	Competitive	Yes	Partial
Chile	Free entry	Competitive	Yes	Full
Jamaica	Monopoly	Monopoly	No	None
Malaysia	Monopoly	Competitive	No	None
Mexico	Monopoly	Competitive	Yes	Partial
Philippines	Free entry[b]	Competitive	No	Partial
Venezuela	Monopoly	Competitive	Yes	Partial

a. Regional monopolies, one confined to operations in the North, and the other to the South.
b. While there are about 60 telecom service operators, PLDT the main operator controls 94% of all telephones.

Table 3 also reveals that except for the Philippines, Malaysia, and Jamaica, all remaining countries resorted to international bidding to award the concession. Argentina, Chile, Mexico and Venezuela received more than one bid from potential suppliers, which

[9] The two regional monopolies in Argentina were each awarded a 7 year exclusive concession for domestic basic services only. TELMEX in Mexico was awarded a 35 year exclusive concession for local basic services but only a 6 year exclusive concession for long distance services. CANTV in Venezuela was given a 30 year concession with exclusivity for basic services only for 9 years. In Malaysia, STM was given a 20 year exclusive concession for provision of basic services.

suggests that they were able to limit the ability of the selected operator to extract rents. In the Philippines, PLDT has operated as a private monopoly for decades. Thus, even if the initial process of awarding the license involved bidding, technology has since changed so much that the value of that information to the regulator is likely to have evaporated. In Malaysia, the government only sold 25 percent of the assets to the private sector. Inspite of regulatory reforms in 1987, the company's management continues to be dominated by the bureaucracy. In Jamaica, Cable & Wireless was operating in the country at the time of privatization and the government did not capitalize on the occasion of privatization to extract information from potential suppliers through bidding.

Finally, table 3 shows that our sample countries varied in the extent to which they introduced the threat of competition. On the one hand, Argentina, Chile, Mexico, Jamaica, and Venezuela all included provisions in the operator's license, the sector's regulation or the sale contract to obligate the private operator to meet specific network expansion and service quality targets, together with a provision that failure to meet these obligations gives the government grounds for revoking the concession and awarding it to another supplier. On the other hand, Malaysia and the Philippines did not explicitly state such a threat in their regulatory framework.

III.3 How did the sample countries attempt to resolve the pricing problem?

Within the group of countries that adopted a cost saving pricing regime, Argentina, Mexico, Venezuela, and Malaysia adopted price cap regulation, while Chile adopted benchmark regulation (table 4). All 5 countries allow tariffs to be adjusted for inflation. However, some did better than others. For example, tariffs are reviewed less frequently in Chile (5 years) and Mexico (4 years) than in Argentina (semi annual) and Venezuela (quarterly). Besides the disincentive emerging from depriving the firm from reaping interim benefits from cost savings, frequent revisions of tariffs are costly and cumbersome to administer. Chile motivated the firms to operate efficiently by adopting a pricing scheme in which tariffs are set for each regulated service on the basis of the incremental costs of an "efficient" firm. The resulting prices are then adjusted to ensure that the firms can earn a

fair rate of return on revalued assets, using the capital asset pricing model (as elaborated in Box 1 below).

Table 4. Price regulation in sample countries

Country	Pricing formula	Frequency of tariff review	Inflation adjustment	Productivity parameter/ Rate of return
Argentina	PC	Semi annual	Indexed to U.S. CPI	X=0%
Chile	BM	Every 5 years	Indexed to CPI	Min. ROA=12%
Jamaica	ROR	Company request	Indexed to CPI	Min. ROE=17.5-20%
Malaysia	PC	Company request	Indexed to CPI	X=0%
Mexico	PC	Every 4 years after 1998.	Indexed to CPI	X=0% 1990-96; X=3% 1997-98
Philippines	ROR	Company request	None	Max. ROA=12 %
Venezuela	PC	Quarterly	Fully Indexed to WPI until 1996. Partial Indexation for 1997-2000.	X=0%

Sources: Hill and Abdala (1994); Galal (1994); Spiller and Sampson (1993); World Bank (1993, 1990); Wellenius et al. (1994); Esfahani (1994); and Clemente (1994).

The Philippines and Jamaica followed rate of return regulation, although in different forms. While Jamaica allows for inflation adjustment, the Philippines is the only country in the sample which does not. Jamaica guarantees the operator net after tax profits within a band of 17.5-20% of shareholders equity. In contrast, the Philippines leaves price determination to a Supreme Court ruling that established a ceiling of 12 % as a fair rate of return on assets of all utilities.

III.4 How did the sample countries attempt to resolve the commitment problem?

With respect to *conflict resolutions,* all countries in the sample anticipated conflicts over pricing, entry, and interconnection, and devised rules to deal with them. The main difference lies in the specificity with which the rules were stated. The degree of specificity is greatest in Chile and Jamaica, and weakest in Argentina, Malaysia and Venezuela.

On the one hand, Chile's regulation defines step by step procedures for arbitration and appeals. Disputes between the firm and regulator over pricing are resolved through a three member arbitration committee, one member selected by each party and the third by mutual agreement. Disputes over entry are resolved by the anti-trust commissions, with

possible appeal to the Supreme Court. Disputes over interconnection are subject to binding arbitration. Similarly, in Jamaica, conflicts pertaining to tariff adjustments are subject to binding arbitration. In addition, the operating license explicitly grants the firm the right to appeal any breach of the terms of the agreement on the part of the government to the Supreme Court, whose ruling can be subjected to review by the Commonwealth Privy Council in London.

On the other hand, although firms in Argentina have the right to bring disputes

Box 1: Price setting procedures for fixed telephony in Chile

1. Demand is first estimated for each service/zone/firm bundle.

2. For each service, the incremental cost of development is then calculated based on the concept of "efficient firm". The incremental cost of development is nothing but the long-run marginal cost (LRMC) adjusted for investment. The law defines the efficient firm as one that starts from scratch and uses only the assets necessary to provide that service. It further stipulates that regulated companies have to have a minimum of 5-year investment program, prepared by the company and presented to SUBTEL following the detailed outline specified in Law 18,168 (article 301).

3. Revenue is then estimated for each service, such that the net present value of providing the service is equal to zero. This revenue is the incremental cost of development.

4. To move from the incremental cost of development to the long-run average cost (LRAC), efficient tariffs are increased in a least distorting fashion so that firms make a fair rate of return.

5. The fair rate of return is defined as the sum of the rates of return on the risk-free assets and the risk premium of the activity, weighted by the systematic risk of the industry. That is

   $R_i = R_{rf} + \beta_i (R_p - R_{rf})$,

   where R_i is the rate of return on revalued capital of firm i, R_{rf} is the rate of return on risk-free assets, β_i is firm i's systematic risk, and R_p is the rate of return on a diversified investment portfolio.

6. Tariffs are recalculated every five years, so the law allows firms to adjust tariffs every two months, using the inflation index of each service and the Divisia index.

7. Disputes between companies and regulators are settled by a committee of three experts, one nominated by each party and the third by mutual agreement.

Source: Galal (1994)

concerning pricing, entry, or interconnection to the attention of the newly established regulatory agency (CNT), the latter's decisions can only be appealed to the minister of economy. In Malaysia, conflicts are first referred to the regulatory agency, beyond which

the procedure is not well defined, often revolving around ad hoc procedures that culminate in decisions by the minister. In Venezuela, disputes over interconnection are resolved through arbitration at the request of either party without further appeal. However, disputes regarding tariffs can only be brought to the attention of the regulatory agency (CONATEL), beyond which it is unclear what recourse the company has.

In the Philippines, there is an explicit procedure to appeal to the Supreme Court to restrain regulatory discretion and resolve conflicts over tariffs, entry and interconnections. However, because the regulatory rules themselves are not clearly defined, the appeal process lacks the basis on which to make such appeals. Nowhere is this more apparent than in price regulation, where only a ceiling on the rate of return is set without explicit provisions for inflation adjustment.

With respect to *enforcement,* table 5 characterizes the enforcing agencies in the sample countries in terms of their neutrality, power of enforcement and capacity to process the information. Neutrality is assured when the enforcing agencies are independent of the bureaucracy or known for independence in the case of the courts. Enforcement power is assumed to exist when the agencies have the right to request the needed information from the firm and to implement the resolutions once reached. Finally, needed skills are assumed to exist when the agency can attract skilled employees or hire consultants when needed.

Table 5. Enforcing agencies, their neutrality, enforcement power, and skills

Country	Agency (s)	Neutrality	Enforcement power	Skills
Argentina	CNT, Minister of economy	Lacking	Yes	Moderate
Chile	SUBTEL, Anti trust commissions, courts, arbitration	Assured	Yes	Strong
Jamaica	MPU, courts, inl. Commonwealth	Assured	Yes	Moderate
Malaysia	JTM, Minister concerned	Lacking	Yes	Moderate
Mexico	SCT	Lacking	Yes	Moderate
Philippines	NTC/DOTC, courts	Lacking	No	Weak
Venezuela	CONATEL, undefined	Lacking	Yes	Moderate

CNT: Comision Nacional de Telecomunicaciones; SUBTEL: Subsecretaria de Telecomunicaciones (Ministry); MPU: Minister of Public Utilities; JTM: Jabatan Telekom Malaysia; SCT: Secretaria de Comunicaciones y Transportes; NTC/DOTC: National Telecommunications Commission and Department of Transport and Communications; CONATEL: Consejo Nacional de Telecomunicaciones.

Our judgement is that only Chile and Jamaica were able to assure neutrality of the enforcing agencies. In Chile, neutrality is derived from relying on multiple agencies to resolve conflicts, and on the reputation for independence of the court system.[10] In Jamaica, Spiller and Sampson (1993) argue for neutrality on the grounds of court independence, with the ultimate appeal to the Commonwealth Council in London serving as a deterring factor against government opportunistic behavior. In all other cases, the regulatory agencies are extensions of the bureaucracy, with the concerned minister having the final say when conflicts arise. The minister may of course attempt to balance the interests of the producers and consumers, but there are no guarantees of such behavior.

All but two countries in the sample have empowered their regulatory agencies with the authority to request the necessary information from the firms and to enforce the regulation. The first exception is the Philippines, where the presence of two agencies with vaguely defined mandates may have undermined their power. Malaysia is another exception in that the company is still publicly owned in large measure, which places the power of enforcement with the bureaucracy.[11]

Finally, it appears that the regulatory agencies are generally at a disadvantage compared with regulated firms, in large measure because they are unable to attract and retain skilled employees due to low civil service compensations. However, Chile, Mexico and Argentina were able to reduce the skill gap by relying on consultants to prepare or review the proposals, for example, for tariff revisions. On the other hand, CONATEL in Venezuela was more than burdened by the need to review tariffs quarterly. As a result, the tariff increases promised to the firm have been delayed from taking effect in 1993.

Finally, our sample countries attempted, with varying degrees of success, to *insulate their regulation* from arbitrary changes arising from political turnovers. Once again, Chile and Jamaica seem to have succeeded the most. Chile resolved this problem by enacting its regulation in a detailed law, which includes specific provisions for tariff formulation and

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[10] Galal (1994) reaches the conclusion of court neutrality on the basis of a study of court rulings over the past 40 years. See also Shugart and Carey (1992) on the nature of governing in Chile.

[11] Although JTM (of Malaysia) is modeled after OFTEL in the U.K., and headed by a Director General, the minister still approves all tariffs and licensing decisions. Tariffs have not changed since 1985, although the company is allowed to adjust them for inflation under the price cap regulation.

interconnection as well as for the procedures to settle disputes. Because the country has a long history of split legislature and the executive branch hardly ever rules by a majority, laws are difficult to change. Moreover, the judicial system and constitution historically upheld private property rights, for example, against nationalization during the Allende administration in the early seventies and land expropriation in the sixties. In Jamaica, the commitment problem was resolved differently. The regulatory regime was incorporated in an explicit license that stipulated a specific rate of return and other terms of operations as well as the conditions under which both parties (firm and regulator) can change the license. To make reneging costly for the government, it was stipulated that any rulings by the Supreme Court in Jamaica would be subject to review by the Commonwealth Privy Council in London. The merit of this process stems from the fact that laws can be overturned in Jamaica's parliamentary system, as new administrations enjoy a majority in congress.

The case of Philippines, on the other hand, illustrates how politics can erode the credibility of regulation. Between 1972 and 1986, the power of governing was concentrated in the executive branch with a few constraints on administrative discretion. Similarly, the independence of the judiciary was compromised because the president was empowered to remove any judge. As a result, the ruling elite could not commit itself to hold to certain policies and to rule out opportunistic behavior (Esfahani, 1994). After 1985, although the political patrons of the elite controlling PLDT were thrown out of power, this elite has nevertheless retained enough clout through political institutions so as to maintain the status quo.

In Mexico, Argentina and Venezuela, it is not clear how the problem of insulating the regulation from political changes was resolved. All three countries have a presidential system, in which the executive often enjoys a majority in congress. Moreover, in Venezuela and Argentina, the legislature refused to ratify a law to establish CNT and CONATEL (the regulatory agencies), which compelled the use of decrees by the executive. These decrees can likewise be revoked by the executive. Accordingly, whatever insulation was provided, it did not originate from the political institutions and the court system.

Alternative explanations have been advanced. In Mexico, Cowhey (1994) argues that the credibility of upholding the agreement with the foreign consortia that purchased

TELMEX stems from the government's concern for the country's reputation and the success of its economic reform program in the wake of the debt crisis and drop in oil prices in the late eighties. The signing of the NAFTA agreement with the U.S. and Canada may have served to strengthen the credibility of this commitment. In Argentina, Hill and Abdala (1994) argue that the privatization and regulation of ENTEL was viewed by the government as a catalyst for the success of the stabilization program enacted to fight hyperinflation in the eighties. A similar argument applies to Venezuela, although reforms have not gone as far in this country as they did in Argentina and Mexico. While these explanations are plausible, their effect may be limited to discouraging governments from reneging on their promises in the short run, leaving open the longer run possibilities.

Malaysia presents a unique case because the regulatory and ownership functions are still exercised by the government, albeit by different members of the bureaucracy. Accordingly, the credibility of the regulatory regime hinges primarily on how the government exercises both functions.

III.5 Summary

Our assessment of the regulatory regimes in the sample countries can best be illustrated by the cases of Chile and the Philippines. Chile awarded the franchise to the private sector through an international bidding, included provisions in the regulation to revoke the license if the firm did not meet agreed targets, and introduced benchmark pricing. It provided firms with explicit conflict resolution mechanisms, allocated the enforcement of the regulation to multiple agencies, many of which are reputed for independence. It also enacted the regulation in a telecommunications law, which is difficult to change without a serious debate, given the split in congress and ruling by minority. In contrast, the Philippines failed to utilize any of the information extracting mechanisms and only provided the operator with a ceiling of a 12 % rate of return on assets. The Philippines also failed to resolve the commitment problem. Although disputes are referred to the court system, the regulatory rules are not stated explicitly, the enforcing agencies do not have clear mandates, and the judiciary is weakened by the influence of the president on

appointing judges. PLDT substituted this lack of commitment by making political affiliations to protect itself.

Our assessment of the regulatory regimes in the remaining countries suggests that they only succeeded in resolving some problems but not others. On the one hand, Jamaica found a credible commitment mechanism to insulate the regulation from political changes by embodying the regulation in an explicit license and allowing appeals to the Commonwealth Council in London. However, it failed to introduce competition even in value added services and followed rate of return regulation, which gives limited incentive to the firm to operate efficiently. On the other hand, Mexico, Argentina and Venezuela all succeeded in ameliorating the information asymmetry problem and adopted cost saving pricing schemes (RPI-X). However, they regulated by decree, leaving conflict resolutions ill defined and the concerned minister with too much discretion. To the extent that presidential decrees can be reversed, this undermines the credibility of safeguarding against opportunistic behavior on the part of successive governments. Although reputation and concern for the success of economic reform may mitigate the negative effect of this arrangement, the long term effect remains uncertain.

Finally, Malaysia's regulatory regime is still evolving, perhaps because the private sector only owns 25 percent of the company.

IV. OUTCOMES: COMPARATIVE RESULTS

The ultimate test of the efficacy of the adopted regulatory regimes lies in the impact they have on performance. To explore whether our assessment of the regulatory regimes correspond to outcomes or not, we compared the performance of the sector before and after the regulatory reforms in the seven countries. We used the following indicators to assess performance: network growth, labor productivity, rates of return to the producers, and several measures of consumer satisfaction. The results are broadly consistent with our assessment of the regulatory regimes.

IV.1 Expansion and productivity

Table 6 reports the average growth rates for network expansion as well as labor productivity before and after reform. Thanks to increased investment, the network expanded dramatically in the post reform period in all countries, except the Philippines and Malaysia. This pattern is consistent with our analysis of the extent to which countries resolved the commitment problem. In particular, it is consistent with our conclusion that Chile and Jamaica were the most successful countries in resolving the commitment problem, while the Philippines and Malaysia were the least successful.

Table 6. Network expansion and labor productivity before and after reform
(average annual growth rates, and lines per worker, respectively)

Country	Period		Network Expansion[a]		Labor Productivity	
	Pre-ref.	Post-ref.	Pre-ref.	Post-ref.	Pre-ref.	Post-ref.
Argentina	1981-90	1991-92	5.3	9.4	58	96
Chile	1981-86	1987-92	7.5	14.3	48	81
Jamaica	1981-87	1988-92	6.2	18.8	35	26
Malaysia	1981-86	1987-92	17.6	12.3	26	54
Mexico	1981-89	1990-92	7.0	12.8	95	122
Philippines	1980-85	1986-92	7.2	4.9	35	36
Venezuela	1981-90	1991-93	6.5	11.8	68	83

a. The pre-reform/post-reform periods for which data are reported are: Argentina:1981-90/1991-92; Chile: 1981-86/ 1987-92; Jamaica: 1981-87/1988-92; Malaysia: 1981-86/1987-92; Mexico: 1981-89/1990-92; Philippines: 1980-85/ 1986-92; and Venezuela: 1981-90/1991-93.
Source: International Telecommunications Union, several editions.

Table 6 also shows a marked improvement in labor productivity, especially in Argentina, Chile, Mexico and Venezuela. These are the countries which adopted efficiency inducing pricing regimes (RPI-X or benchmark regulation). In contrast, labor productivity either declined or showed negligible improvement in Jamaica and the Philippines, the only countries in the sample which adopted rate of return regulation.

IV.2 Returns to capital and impact on consumers

Table 7 reports the average (after tax) rates of return on net worth before and after reform in the sample countries. Net worth is used as a denominator rather than revalued assets because reliable data on the latter were not available. The table clearly indicates that all producers did better after reform. However, there is a large variance around the mean.

On the one hand, the Philippines's telecom sector reportedly makes the highest rate of return, which is consistent with the notion that the country did not successfully resolve the information, pricing or the commitment problems. On the other hand, the sector made the lowest rates of return in Argentina and Chile. The Chilean case is easier to explain because it is the country which we judged to have reasonably resolved the three regulatory problems. In Argentina, the explanation may reside with the existence of two suppliers of the service, which may have enabled the regulators to extract more information.

Table 7. Returns on net worth before and after reform, (percent annual averages)

Country	Pre-reform	Period	Post-reform	Period
Argentina	-5.7	1985-88	7.7	1991-93
Chile	6.7	1983-86	13.8	1987-91
Jamaica	13.5	1982-87	20.5	1988-91
Malaysia	--	1982-86	14.0[a]	1987-92
Mexico	9.5	1982-89	22.4[b]	1990-93
Philippines	15.5	1980-85	25.7	1986-91
Venezuela	-10.9	1986-89	21.7	1991-93

-- information not available.
a. Profit before taxes over net worth for 1990 only.
b. Estimate based on World Bank projections of revenues and expenses for TELMEX.
Sources: Hill and Abdala (1994); Galal (1994); Spiller and Sampson (1993); World Bank (1993, 1990); Wellenius et. al (1994); Esfahani (1994); Clemente (1994).

From the perspective of the consumers, they undoubtedly benefitted from expansion (especially in Chile, Argentina, Jamaica, Mexico and Venezuela), as compared with countries where the rate of expansion fell (the Philippines and Malaysia). Not surprisingly, pending demand -- the ratio of applications for phone service to phones installed -- declined in Argentina and Mexico and increased in the Philippines (table 8). But pending demand also increased in Chile, Jamaica, and Venezuela, despite rapid growth in the number of phone lines; this is probably because, as the prospect of actually obtaining a phone improves, more people apply, so that the ratio of applicants to phones initially surges. Thus, the two countries with the highest pending demand (the Philippines with 79 percent, and Jamaica with 81 percent) have very different stories to tell: slow system growth in the Philippines; rapid growth in Jamaica.

Table 8. Quality of service indicators, before and after reform.

Country	% of Unsuccessful Calls A	Year	B	Year	Average pending demand[a] (%) A	Period	B	Period
Argentina	19	1990	13	1992	32	1981-90	10	1991-92
Chile	--	--	1	1992	33	1981-86	35	1987-92
Jamaica	--	--	--	--	72	1986-87[b]	81	1989-92
Malaysia	--	--	--	--	24	1981-86	7	1987-92
Mexico	11	1988	9	1992	22	1981-89	16	1990-92
Philippines	--	--	18	1992	46	1980-85	79	1986-92
Venezuela	43	1990	37	1992	25	1981-90	35	1991-93

For each indicator column A refers to pre reform and column B to post reform; -- Information not available.
a. Ratio of waiting list to main lines in operation.
b. No information was available for 1981-85.
Source: International Telecommunications Union (various issues).

Besides benefitting from expansion in the system, consumers in all countries for which we have data also benefitted from better service, as indicated by improvements in the call completion rate (table 8). But levels of quality varied widely; in particular the sharp contrast between Chile and the Philippines persists; in 1992 only 1 percent of the calls were unsuccessful in Chile, while in the Philippines 37 percent of the calls were unsuccessful.

With respect to prices, this is one area where compiling comparable data proved to be the most difficult. Even where it was feasible to distinguish calls by customers and peak and off peak periods, apportioning fixed costs to different services and exchange rate manipulations reduced the value and comparability of the data. Accordingly, we found it useful to simply estimate the changes in consumer surplus using real revenue per line as a proxy for the price and the number of operating lines as a proxy for quantity. The changes in consumer surplus are then approximated using Slutsky compensation.[12] To facilitate inter country comparisons, we normalized the average annual changes in consumer surplus by the sector's corresponding average annual revenues. The results are reported in table 9, which shows that consumers were better off in Argentina, Chile and Jamaica. They were worse off in the remaining countries, especially in Mexico, Venezuela, and the Philippines.

[12] According to Slutsky's compensation, changes in real consumer surplus in year t are estimated as $(P_t - P_{t-1}).Q_{t-1}$ where, P is the real price and Q is the quantity sold.

Table 9. Real Changes in Consumer Surplus
(average annual changes in consumer surplus relative to sector's average annual revenues)

Country	Pre-reform	Period	Post-reform	Period
Argentina	-7.1	1981-90	-4.7	1991-92
Chile	0.4	1981-86	0.5	1987-92
Jamaica	-13.4	1981-87	8.1	1988-92
Malaysia	4.2	1982-86	1.8	1987-92
Mexico	1.1	1982-89	-13.2	1990-92
Philippines	0.0	1980-85	-5.1	1986-91
Venezuela	10.4	1986-89	-7.8	1991-93

Source: Calculated from data from International Telecommunications Union (various editions).

IV.3 Adding it all up

We focused so far on linking the changes in outcomes with the success or failure in resolving the three regulatory problems identified at the outset. The question remains, however, as to whether the net welfare effect of reforms has been positive or negative. The answer obviously depends on whether the changes in producer and consumer surplus move in the same or opposite directions. In cases where the producers and consumers were both better off after reform, it is possible to declare the regulatory reforms and privatization a success. This conclusion holds for Chile, Argentina and Jamaica. The same conclusion can not be drawn, however, in cases where the producers were better off but not the consumers, as in Malaysia, Mexico, Venezuela and the Philippines. The net effect of reform in these cases depends on the magnitude of the gains and losses and the weights attached to each. It also depends on whether the reform led to more investment, higher efficiency and better pricing, or not.

With respect to Mexico, a comprehensive evaluation of the welfare effects of privatizing TELMEX is available (Galal et al., 1994). The conclusion of this evaluation is that the privatization of the company was welfare improving, thanks to improved productivity and more efficient pricing policy. While we cannot draw such a conclusion for Malaysia and Venezuela, it seems reasonable to conclude that the reform in the Philippines has not been welfare improving, given that investment declined and productivity remained

stagnant after reforms. In other words, there has been no increase in the welfare pie to create the possibility of making someone better off without making anyone else worse off.

V. CONCLUSIONS

A useful understanding of regulation should both help us explain and predict the behavior of regulated firms and the regulators as well as the results emerging therefrom. In this paper, we drew on the recent contracting literature in an attempt to link the performance of the telecom sector with the extent to which seven developing countries successfully resolved the information asymmetry, pricing and commitment problems. Although our sample is small and not random, our findings are generally consistent with the predictions of this literature. On the one hand, Chile was able to reasonably resolve all three problems, leading to higher private sector investment, reasonable rates of return to the producers and improvements in consumer satisfaction. On the other hand, the Philippines failed to reasonably resolve all three problems, leading to disappointing performance. The analysis of the remaining five countries shows a mixture. For example, Jamaica resolved the commitment problem but fell short in resolving the information and pricing problems. The results were also mixed: investment increased but in combination with relatively high rates of return to the producers. At the other end of the scale, Venezuela reasonably resolved the information and pricing problems, but fell short on commitment. As a result, the private sector is making excessive rates of return but at the expense of the consumers.

These findings generate a number of policy implications. First, successful regulatory design has to address the information asymmetry, pricing and commitment problems simultaneously. Resolving one problem without the others can lead to under investment or excessive rates of return to the producers at the expense of consumers.

Second, while resolving the commitment problem requires devising clear conflict resolution mechanisms, enforcing the regulation at reasonable costs, and insulating regulation from arbitrary changes caused by political turnovers, the actual implementation of these principles in a given context requires an understanding of the history and prevailing political and judicial institutions in each country.

Third, compromises and attention to details are vital in resolving the information, pricing and commitment problems. Or, as often put, the devil is in the details. To give but one example, where a country is unable to commit credibly because it does not have appropriate neutral enforcing agencies, it would not be appropriate to leave the X factor in price cap undetermined. Failing this, private investment may not be forthcoming.

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